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BUREAU OF MINES MINERALS YEARBOOK

The Mineral Industry of Oregon

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This publication is a chapter from the current Bureau of Mines Minerals Yearbook, comprising *Volume I, Metals and Minerals*; *Volume II, Area Reports: Domestic*; *Volume III, Area Reports: International*. The separate volumes of the Yearbook are sold by the Superintendent of Documents, Washington, D.C. 20402.

The Mineral Industry of Oregon

This chapter has been prepared under a Memorandum of Understanding between the Bureau of Mines, U.S. Department of the Interior, and the Oregon Department of Geology and Mineral Industries for collecting information on all nonfuel minerals.

By Herbert R. Babitzke¹ and Howard C. Brooks²

Oregon's nonfuel mineral production value rose in 1984 to \$120 million, an increase of about 9% from the \$111 million recorded in 1983. Industrial minerals accounted for nearly all of the nonfuel mineral value reported for the year. Stone was the leading commodity in terms of value, followed by construction sand and gravel, cement, and lime; these commodities accounted for nearly 93% of the total value. Oregon ranked

37th in the Nation in the value of nonfuel mineral production for 1984.

Oregon did not regain prerecession levels of employment in its mineral industry in 1984, but year-over-year gains continued at about 3%. From the standpoint of employment in the industry, i.e., wages and salaries, Oregon's recovery rate was about 50% by yearend.

Table 1.—Nonfuel mineral production in Oregon¹

Mineral	1983		1984	
	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays ----- thousand short tons.	188	\$275	189	\$288
Gem stones ----- NA	NA	600	NA	400
Gold (recoverable content of ores, etc.) ----- 322	322	137	W	W
Nickel (content of ores and concentrates) -----	--	--	14,540	W
Sand and gravel (construction) ----- thousand short tons.	*11,000	*37,000	12,776	37,117
Silver (recoverable content of ores, etc.) ----- thousand troy ounces.	1	10	W	W
Stone (crushed) ----- thousand short tons.	13,089	*39,873	*12,500	*37,500
Talc (soapstone) ----- do.	(²)	123	(²)	66
Combined value of cement, copper (1983), diatomite, lead (1983), lime, pumice, sand and gravel (industrial, 1983), stone (dimension, 1983), and values indicated by symbol W -----	XX	32,922	XX	45,031
Total -----	XX	*110,940	XX	120,402

*Estimated. ¹Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.

²Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

³Less than 1/2 unit.

Table 2.—Value of nonfuel mineral production in Oregon, by county¹

County	(Thousands)		Minerals produced in 1983 in order of value
	1982	1983	
Baker	\$11,299	W	Cement, stone (crushed), clays, pumice, silver, copper, lead.
Benton	1,075	\$636	Stone (crushed).
Clackamas	W	W	Cement, stone (crushed).
Clatsop	W	510	Stone (crushed).
Columbia	W	271	Do.
Cook	W	1,910	Do.
Crook	W	W	Do.
Curry	W	485	Do.
Deschutes	W	W	Pumice, stone (crushed).
Douglas	W	1,361	Stone (crushed).
Gilliam	W	(²)	Stone (crushed).
Grant	W	W	Do.
Harney	W	258	Do.
Hood River	(³)	213	Do.
Jackson	1,628	W	Talc, stone (crushed).
Jefferson	(³)	W	Stone (crushed).
Josephine	W	137	Gold, silver.
Klamath	W	W	Stone (crushed), clays.
Lake	W	W	Diatomite, stone (crushed).
Lane	2,905	2,279	Stone (crushed).
Lincoln	(³)	1,616	Do.
Linn	535	118	Do.
Malheur	1,977	W	Lime.
Marion	1,653	W	Stone (crushed).
Morrow	W	W	Do.
Multnomah	16,474	W	Lime, stone (crushed), sand and gravel (industrial), clays.
Polk	122	318	Stone (crushed).
Sherman	W	W	Do.
Tillamook	W	273	Do.
Umatilla	470	1,044	Do.
Union	143	(³)	Do.
Wallowa	4	W	Stone (crushed).
Washington	182	6,506	Do.
Yamhill	305	1,872	Do.
Undistributed ⁴	² 27,165	54,132	
Sand and gravel (construction)	XX	³ 37,000	
Stone:			
Crushed	⁴ 41,900	XX	
Dimension	⁵ W	XX	
Total ⁶	² 107,840	110,940	

⁴Estimated. ²Revised. W Withheld to avoid disclosing company proprietary data; included with "Undistributed." XX Not applicable.

¹Wasco and Wheeler Counties are not listed because no nonfuel mineral production was reported.

³Construction sand and gravel was produced; data not available by county. Total State value is shown separately under "Sand and gravel (construction)."

⁵Stone, either crushed or dimension, was produced; data not available by county. Total State values are shown separately under "Stone."

⁶Includes some gem stones, stone (crushed), and stone (dimension) that cannot be assigned to specific counties and values indicated by symbol W.

⁷Data may not add to totals shown because of independent rounding.

THE MINERAL INDUSTRY OF OREGON

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Table 3.—Indicators of Oregon business activity

	1982 ^a	1983	1984 ^b
Employment and labor force, annual average:			
Population	2,668	2,658	2,674
Total civilian labor force	1,324	1,341	1,336
Unemployment	153	145	125
Employment (nonagricultural):			
Mining total	1.8	1.6	1.6
Metal mining ^c	2	1	NA
Manufacturing total	185.7	188.8	198.7
Primary metal industries	8.1	7.5	9.1
Stone, clay, and glass products	3.4	3.0	2.6
Chemicals and allied products	2.1	2.2	2.1
Petroleum and coal products	.5	.5	.5
Construction	28.9	27.0	29.9
Transportation and public utilities	56.8	55.4	56.2
Wholesale and retail trade	238.7	242.6	252.4
Finance, insurance, real estate	64.9	64.5	65.7
Services	188.6	194.6	205.0
Government and government enterprises	195.5	192.3	194.6
Total ²	961.1	966.7	1,000.4
Personal income:			
Total	\$27,100	\$28,545	\$31,052
Per capita	\$10,156	\$10,737	\$11,611
Hours and earnings:			
Total average weekly hours, production workers	37.9	38.9	39.2
Total average hourly earnings, production workers	\$10.02	\$10.21	\$10.44
Earnings by industry:			
Farm income	\$471	\$493	\$574
Nonfarm	\$18,121	\$19,138	\$20,829
Mining total	\$42	\$38	\$37
Metal mining	(³)	\$1	(³)
Nonmetallic minerals except fuels	W	\$24	\$23
Coal mining	W	\$11	\$11
Oil and gas extraction	W	\$2	\$4
Manufacturing total	\$4,449	\$4,716	\$5,211
Primary metal industries	\$264	\$253	\$305
Stone, clay, and glass products	\$85	\$81	\$79
Chemicals and allied products	\$43	\$48	\$49
Petroleum and coal products	W	\$17	\$17
Construction	\$812	\$801	\$909
Transportation and public utilities	\$1,568	\$1,625	\$1,725
Wholesale and retail trade	\$3,478	\$3,656	\$3,983
Finance, insurance, real estate	\$942	\$1,025	\$1,096
Services	\$3,328	\$3,599	\$4,011
Government and government enterprises	\$3,376	\$3,534	\$3,701
Construction activity:			
Number of private and public residential units authorized	7,720	8,694	8,036
Value of nonresidential construction	\$484.1	\$439.0	\$525.9
Value of State road contract awards	\$172.4	\$226.8	\$217.1
Shipments of portland and masonry cement to and within the State	574	554	609
Nonfuel mineral production value:			
Total crude mineral value	\$107.8	\$110.9	\$120.4
Value per capita	\$40	\$42	\$45

^aPreliminary. ^bRevised. NA Not available. W Withheld to avoid disclosing company proprietary data.¹Bureau of Economic Analysis, Regional Economic Measurement Division, U.S. Department of Commerce.²Data may not add to totals shown because of independent rounding.³Less than 1/2 unit.

Sources: U.S. Department of Commerce, U.S. Department of Labor, Highway and Heavy Construction Magazine, and U.S. Bureau of Mines.

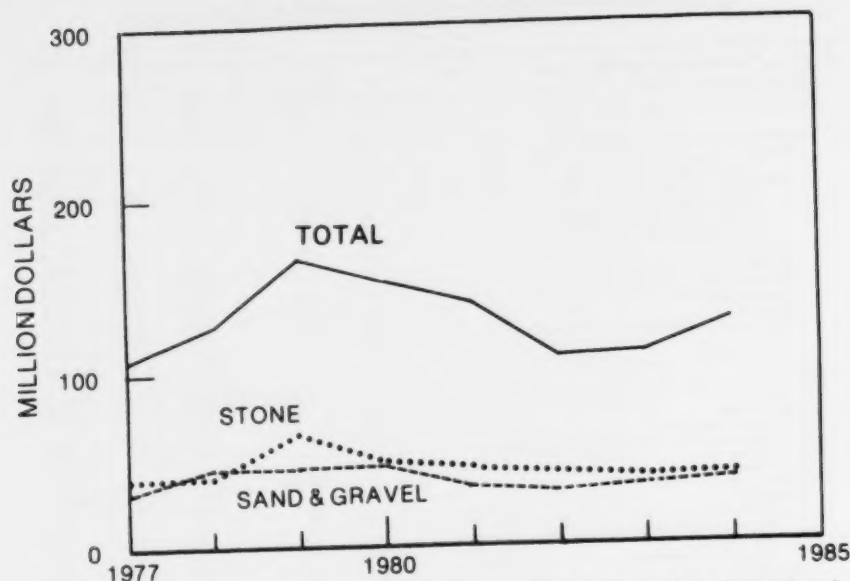


Figure 1.—Value of sand and gravel and stone and total value of nonfuel mineral production in Oregon.

Trends and Developments.—The Hanna Mining Co. produced about 1 million pounds of nickel per month at its integrated mine and smelter complex near Riddle. The operation, the sole domestic nickel producer, resumed production in late 1983, following an 18-month shutdown. Aluminum companies curtailed production during the year. Reynolds Metals Co. idled two potlines at its Troutdale smelter in July, reducing production by 38% to 80,000 short tons of metal per year. Martin Marietta Aluminum Inc. reduced its operating rate at The Dalles reduction plant to one-half capacity in June and announced a complete shutdown of the plant by yearend. Both companies blamed the reduction on faltering aluminum prices and higher power rates. In addition, Alumax Inc. abandoned plans to build a \$660 million, 220,000-ton-per-year-capacity aluminum smelter near Umatilla.

Titanium markets improved in 1984, and production increased at Oregon Metallurgical Corp. in Albany, the Nation's third largest producer. Albany Titanium Inc. (AL-Ti) was building two pilot plants to test a new process that would produce titanium sponge from domestic ilmenite.

Eagle-Picher Industries Inc. announced

plans to build a \$13 million diatomite plant 7 miles west of Vale in eastern Oregon's Malheur County. The diatomite would be mined from deposits on public and private lands near the Malheur-Harney County line. The Eagle-Picher plant would be the second in the State producing diatomite. The other, in Lake County, was not expected to be in competition because end-use destinations are dissimilar. Oregon Portland Cement Co., a wholly owned subsidiary of Ash Grove Cement Co., was redesignated as Ash Grove Cement West Inc. in July. Ash Grove is the largest cement producer in the Northwest.

Exploration Activities.—Most metallic mineral exploration projects in 1984 were for gold and silver. Exploration efforts were concentrated in the northeastern and southwestern parts of the State, where most of Oregon's productive precious metals mines have been situated. Several major companies, however, continued to explore parts of southeastern Oregon for gold deposits.

American Copper & Nickel Co. Inc. continued exploration programs in the Susanville District, the Sunrise Butte area, and the Bald Mountain-Ibex Mines area.

The Susanville District is a small area in



Grant County in the western part of the Blue Mountains gold belt. District gold output was mainly from placers. American Copper & Nickel began its exploration program in the district in 1980. Target areas include parts of the old Badger, Bull of the Woods, and Gem lode gold mines. Work included rehabilitation of some underground workings, surface trenching, and drilling. About 6,000 feet of diamond drilling was done during the summer.

Sunrise Butte is in the western part of the Greenhorn District, also in Grant County. Old mines in the vicinity include the Ben Harrison, Morris, and Tiger. Work by American Copper & Nickel included surface sampling, mapping, geophysics, and drilling. About 2,000 feet of drilling was done in 1984.

Bald Mountain and Ibex Mines are adjoining properties in Grant and Baker Counties in the Cracker Creek mining district, about 5 miles northwest of Sumpter. These old properties produced small amounts of gold at various times in the past and were acquired by NERCO Minerals Co. in mid-1980. Ibex Mining Co. was formed as the operating company. During 1981 and through 1983, 3,200 feet of old workings was reopened, and 54,000 feet of exploration diamond drilling and 2,000 feet of new underground work were done. In 1984, American Copper & Nickel joined the venture and became the operating partner. The company surface drilled about 12,700 feet (33 holes) during the summer. An underground exploration program was being considered for 1985.

M and S Associates did some exploration and development work at the Friday and Hidden Treasure Mines in the Virtue gold mining district, about 8 miles east of Baker. Work accomplished by M and S included some large dozer cuts and the construction of a small vat-type cyanidation plant.

The Sunday Hill Mine, in the northern part of the Mormon Basin mining district in Malheur County, was acquired in 1983 by Capri Resources Ltd. of Vancouver, British Columbia, Canada. Seven diamond drill holes were drilled in 1984; additional work was planned.

In 1984, Manville Products Corp. acquired the old Record gold mine at the northwestern end of the Grouse Spring property in Baker County. The Record Mine produced about \$100,000 in gold prior to World War II from narrow quartz veins along the contact between quartz diorite and serpentinite.

Reevaluation of the property was started and was to be continued in 1985.

Exploration in the Keating area of Baker County included work in the vicinity of the old Mother Lode Mine. This property produced about 1 million pounds of copper and 8,000 troy ounces of gold in the late 1930's. Some drilling was done in 1983 and 1984.

Work continued on a massive sulfide deposit in the McCulloch Creek area near Glendale in southern Douglas County. Exploration was started by Exxon Minerals Co. in 1978. Boise Cascade Corp. entered into a joint venture on the project in 1984. Some diamond drilling, soil geochemistry, and geophysical work was done. Boise Cascade also did some exploration work at the old Gold Note Mine on the Josephine-Jackson County line.

Mega Gold Resources Ltd. continued its evaluation of the Greenback gold mine in Josephine County near the head of Tom East Creek, 1-1/2 miles north of the old settlement of Placer. The main vein, with a length of more than 500 feet, averages 20 inches in width and terminates in a fault to the west and against serpentinite to the east. Gold was 75% free milling. Geologic mapping by Mega Gold indicated 18 parallel quartz veins in a 4,500-foot-long band of greenstone.

Wesley Pieren and Associates was doing development work at the old Sugar Pine gold mine west of Galice in Josephine County, where about 3,000 feet of old workings was explored. Old adits were opened and sampled, and a new lower level adit was started.

Ray Rock Mines Inc. continued exploration at the Turner Albright Mine near the California border of southern Josephine County. Considerable exploration work has been done in recent years, including work by Beretta in 1980 and 1981 and by Noranda Exploration Inc. in 1982 and 1983. Noranda reported reserves of 3.3 million short tons averaging 0.114 troy ounce of gold per ton, 0.443 ounce of silver per ton, 1.46% copper, 3.32% zinc, and 0.055% cobalt. Ray Rock acquired the property in 1983 and has reportedly increased the reserves reported by Noranda.

Exploration continued in the vicinity of the old Axehandle and Red Jacket mercury mines, now called the Rejax Prospect, in Jefferson County. Over the years, total mercury output was about 150 flasks. Ocelot Industries Ltd. prospected epithermal gold occurrences in the area for several years.

and was joined by Meridian Land and Minerals Co. in 1984. Some drilling was done during the 1984 field season.

Major mining companies active in east central Oregon during recent years are Manville, Freeport Exploration Co., Homestake Mining Co., and Meridian. The Birch Creek, Vale Butte, and Red Butte properties are owned by Manville. Some drilling was done at Birch Creek and Vale Butte by Meridian in 1984.

The Anaconda Minerals Co. continued prospect drilling in the Quartz Mountain area of Malheur County in 1984. Drilling began in 1983 and plans were to continue in 1985. Anaconda land holdings in the area total about 5 square miles. For many years, the Quartz Mountain District has been known to contain small mercury deposits of the opalite type.

Noranda continued to surface diamond drill in the Idol City area in Harney County, north of Burns. The exploration target was a zone of gold-silver mineralization. The area had previously been placer mined on a small scale.

Legislation and Government Programs.—The Oregon Wilderness Bill became law when legislation approved May 24, 1984, by the U.S. Senate was signed by the President. This action put another 935,000 Oregon acres into Federal wilderness status; Oregon now has 2.1 million acres in wilderness.

The Governor of Oregon and the Secretary of the Interior formed a joint Federal-State working group in February to consider the economic, engineering, and environmental aspects of possible ocean mining of polymetallic sulfide resources from the Gorda Ridge, and to share in the scoping and preparation of an environmental impact statement to assess the development potential of these resources. Both the Governor

and the Secretary agreed to reduce the proposed Gorda Ridge lease offering within the 200-mile Exclusive Economic Zone off the Oregon coast from 40 million offshore acres to not more than 4 million acres. At the same time, a joint Federal-State working group was formed to carry out the mandate. The agreement also eliminated from the lease offering the near-shore sections of the original proposed area. The Gorda Ridge is a large underwater range seaward of the Continental Shelf thought to contain deposits of polymetallic sulfides.

Strategic minerals potentially worth billions of dollars may be present in a vast undersea area off the Oregon coast. The 70,000-square-mile area is in the new Exclusive Economic Zone and is between 30 and 200 miles offshore, extending from Lincoln City south beyond Eureka, CA. Sampling on sections of the Gorda Ridge by the U.S. Minerals Management Service produced results indicating the presence of large quantities of copper, iron, and zinc, and lesser quantities of other strategically important metals.

Mineral leasing payments to Oregon by the U.S. Bureau of Land Management totaled \$1.65 million.

To date, over 1,400 acres of mined land in Oregon has been reclaimed to agriculture, forestry, housing, industry, recreation, wildlife habitat, and other uses. The 1984 Award for the Outstanding Mined Land Reclamation Project went to two nominees—the Oregon State Highway Division (OSHD) and Portland General Electric Co. (PGE). PGE was honored for the reclamation of its proposed Pebble Springs nuclear site in Gilliam County. The site was returned to productive grazing land. OSHD reclaimed approximately 16 acres of a basalt quarry on Rattlesnake Butte, south of Cottage Grove, Lane County.

REVIEW BY NONFUEL MINERAL COMMODITIES

NONMETALS

The value of industrial mineral production in Oregon increased 4% over that recorded for 1983.

There were 422 sites under permit in 1984 under the Surface Mined Land Reclamation Program, most of which were for industrial minerals (primarily sand and gravel and stone).

Cement.—Cement production in the State for 1984 increased 7% over that reported in

1983; Ash Grove Cement West Inc. (formerly Oregon Portland Cement Co.) was the sole producer. Ash Grove operated its limestone quarry and cement plant near Durkee, Baker County, throughout the year. Oregon Portland began operating the Durkee quarry in 1959, and until 1981, produced limestone for its cement plants at Lime and Lake Oswego. In 1980, a new plant was built at the Durkee site, and the clinker producing facilities at Lime and Lake Oswego were phased out. The plant at Lime is now used

only for bagging, and the Lake Oswego plant is used as a distribution facility. The Durkee plant has an annual capacity of 500,000 short tons of cement and employs about 100 people year-round. Company management indicated that current orders for cement would require near-capacity production through 1985.

Portland cement produced in 1984 was used as follows: 73% by ready-mixed concrete companies, 13% by highway contractors, 7% by concrete products manufacturers, and 7% by building material dealers and others. Raw materials used to produce cement were clays, gypsum, iron ore, limestone, and shale.

Clays.—Common clays, used chiefly in brick and cement, were produced in Baker, Klamath, and Multnomah Counties. Both quantity and value increased slightly over those in 1983. At Adrian, in Malheur County, Teague Mineral Products Co. continued to produce bentonitic clay and zeolite for various uses. Bentonite production was at the rate of about 12,000 short tons per year; about 10,000 tons of zeolite was produced in 1984. The bentonite and zeolite were mined from deposits in the Sucker Creek area; the grinding, drying, and bagging plant is in Adrian. Teague reported that development of a new bentonite deposit 20 to 25 feet thick with a dip of 19° was begun in 1984. A total of 12,000 feet of drilling was done on the deposit during the year.

Diatomite.—In January, Eagle-Picher announced plans to invest \$13 million in a diatomite mine and treatment facilities in Malheur and Harney Counties. The plant-site is 7 miles west of Vale, and the minesite is near Drewsey, 65 miles further to the west. Production was expected to be from 140,000 to 150,000 bank cubic yards of diatomite ore per year. Mill waste at 30,000 to 33,000 cubic yards per year would be back-hauled to the minesite for final disposal. The company has obtained conditional mine-use permits on 3,700 acres, and long-term mining plans call for development on private, State, and Federal lands over the next 15 to 20 years. The operation would employ 30 to 35 people. Construction of the plant began in the fall of 1984 and was expected to be completed in mid-1986.

Oil-Dri Production Co. continued to produce diatomite at its quarry and plant in Christmas Valley. Most of the product was used for cat litter and as an oil absorbent; some was used as an anticaking additive in animal feeds and as a carrier for hazardous wastes. Mining, processing, packaging, shipping, and marketing of the diatomite was

handled by Oil-Dri. Between 30 and 35 people were employed year-round. Retailing was done through food and drug chains in 11 Western States and in western Canada.

Lime.—Lime production in Oregon for 1984 increased 11% in volume and 12% in value over that reported in 1983. Ash Grove in Multnomah County and Amalgamated Sugar Co. in Malheur County continued lime production throughout the year. Most of the lime produced was quicklime; some hydrated lime was produced by Ash Grove. The Ash Grove lime was used by the pulp and paper and electric steel industries, while that produced by Amalgamated Sugar was used in the company's own sugar refinery. The hydrated lime was used primarily for oil and grease treatment, road stabilization, and animal feed.

Peat.—Clatsop Peat Co. was formed to mine and market peat from a 5- to 12-foot-thick deposit 1-1/2 miles northeast of Gearhart, Clatsop County. Approximately 8 acres of cleared, nearly flat land is available for mining. Excavation was to be done with floating equipment.

Pumice.—Oregon ranked first in the Nation for pumice production in 1984. The quantity of pumice produced in the State increased slightly over the 1983 production level, but the value was up more than 10% over that reported in 1983. Pumice was produced by Central Oregon Pumice Co. and Cascade Pumice Co./Graystone Corp. from two pits in the Bend area, Deschutes County. Primary uses were for concrete aggregate (52%), decorative building block (38%), road construction and maintenance (5%), and landscaping and roofing (5%).

Sand and Gravel (Construction).—Construction sand and gravel is surveyed by the U.S. Bureau of Mines for even-numbered years only; therefore, this chapter contains only estimates for 1983. Data for odd-numbered years are based on annual company estimates made before yearend.

Oregon's 1984 output of construction sand and gravel increased more than 34% in quantity and 21% in value over that reported for 1982, when the last complete canvass was taken. Construction sand and gravel was produced from 198 operations by 83 companies in 27 counties. Six companies and one Government agency produced 50% of the State's construction sand and gravel in 1984; the leading 22 producers accounted for 80% of the total. The product was transported by truck (86%), waterway (1%), and by other means (4%), and 9% was used on-site. Uses of construction sand and gravel are shown in table 4.

Table 4.—Oregon: Construction sand and gravel sold or used in 1984, by major use category

Use	Quantity (thousand short tons)	Value (thousands)	Value per ton
Concrete aggregate	1,738	\$5,773	\$3.32
Plaster and gunite sands	W	W	7.81
Concrete products	W	W	3.90
Asphaltic concrete	950	3,133	3.30
Road base and coverings ¹	2,354	7,319	3.11
Fill	503	1,099	2.18
Snow and ice control	40	121	3.01
Other ²	7,191	19,673	2.74
Total or average	12,776	\$37,117	2.91

W Withheld to avoid disclosing company proprietary data; included with "Other."

¹Includes road and other stabilization (cement).

²Includes other unspecified uses and uses indicated by symbol W.

³Data do not add total shown because of independent rounding.

Stone.—Stone production is surveyed by the U.S. Bureau of Mines for odd-numbered years only; this chapter contains only estimates for 1984. Data for even-numbered years are based on annual company estimates made before yearend.

The Quartz Mountain silica mine in eastern Douglas County supplied metallurgical-grade silica for use in the reduction of nickel ore to ferronickel at the Hanna Mining smelter near Riddle. About 7,300 short tons of silica was mined from Quartz Mountain during the year, and silica was also shipped from a stockpile of previously mined material.

Bristol Silica and Limestone Co.'s mine near Gold Hill produced about 24,000 tons of dolomite, limestone, shale, and silica during 1984. Most of the silica was marketed at the Dow Corning Chemical Co. metallurgical plant in Springfield.

Genstar Stone Products Co. optioned the Jones marble deposit west of Williams in Josephine County to test the quality and quantity of white marble for possible use in making paper. Work on a drilling program was accomplished in 1984.

Talc (Soapstone).—Steatite of Southern Oregon Inc.'s rate of production of soapstone for art carving and other specialty uses was slightly lower than in previous years. The mine is on Elliott Ridge, southeast of the new Applegate Reservoir in Jackson County, and the plant is in Grants Pass, Josephine County. The high-quality soapstone product was marketed on a worldwide basis.

METALS

Aluminum.—Aluminum production in the State increased nearly 18% in quantity and 34% in value over that of 1983. Riding on a continuation of the economic recovery that began in mid-1983, Oregon's aluminum

smelters were operating at full capacity at the start of 1984. A worldwide aluminum oversupply, however, led to a 68% drop in aluminum prices by midyear. This factor, together with increased power rates, led first to layoffs and finally to a permanent shutdown at one smelter. Martin Marietta Aluminum laid off 175 workers in June at its reduction plant in The Dalles and reduced the operating rate to 50% of capacity. In December, the company proceeded to a total shutdown and the permanent layoff of the remaining 240 workers. The company rebuffed bids by private investors and employees to purchase the smelter and refused to delay closing of the plant to allow time for a feasibility study preparatory to a buy out.

Reynolds Metals shut down 2 potlines at its Troutdale smelter in July, reducing its output by 50,000 short tons of metal per year and idling 225 of the plant's 950 workers.

Alumax abandoned plans to build a \$660 million aluminum smelter near Umatilla.

Columbium, Tantalum, Zirconium, Hafnium, and Vanadium.—Teledyne Wah Chang Albany (TWCA) was listed among eight major domestic processors and/or producers of columbium and tantalum in 1984. The company, which employs 1,300 people at its Albany plant, has facilities to produce columbium and tantalum metal, columbium pentoxide, and ferrocolumbium. Overall reported domestic consumption of columbium in steels and superalloys was up in 1984, and tantalum consumption continued to rise, as reflected in the 26% increase in overall shipments reported by the Tantalum Producers Association. TWCA continued to be the Nation's leading producer of zirconium and hafnium, metals used in manufacturing nuclear fuel rods; the two

metals accounted for 70% of the company's production. The company provided metal for fuel rods for 80 operating nuclear plants, for 60 plants under construction, and for nuclear-powered Navy ships. TWCA also produced high-purity vanadium metal for vanadium-gallium superconductors and for other applications in the aerospace, electronic, and nuclear industries.

Gold, Silver, Copper, and Lead.—A number of small gold placers were active in Baker and Grant Counties, northeastern Oregon, and in Josephine and Douglas Counties, southwestern Oregon. Few produced more than 50 troy ounces of gold, and most probably produced less than 10 ounces. The most productive placer operations in eastern Oregon were on Pine Creek near Hereford and on Clarks Creek near Bridgeport, both in Baker County. Numerous small placer operations continued active in Josephine County, including several on Josephine Creek and its tributaries, Canyon Creek and Fiddler Gulch. Sucker Creek continued to be worked in several places. There were also operations on Democrat Gulch and Althouse Creek. The semicemented outwash gravels of Democrat Gulch near Holland were worked by shafts and drift mining along bedrock. There were also several placer operations in the Galice area and along Galice Creek, Rocky Gulch, Taylor Creek, and the Old Channel Mine. In Douglas County, some placer activity continued along Cow Creek and its tributaries. One operation on Coffee Creek northwest of Tiller has been active for 4 years.

Lode gold and silver and base metals production was mainly from the Iron Dyke, Bay Horse, and Thomason Mines in Baker County and the Pyx Mine in Grant County, each of which was operated only part of the year.

The Iron Dyke and Bay Horse Mines were each operated by Silver King Mines Inc. for about 6 months during 1984. Both mines were closed near the end of August. The ore was trucked to Silver King's mill at the company's Copper Cliff Mine near Cuprum, ID. The mill was closed after treatment of the ore was completed.

Company reports to the State of Oregon indicate 1984 production at the Iron Dyke was about 6,000 short tons averaging 0.26 ounce of gold, 1.4 ounces of silver, and 2.3% copper per ton. Reserves were reported as about 20,000 tons averaging 0.3 ounce of gold and 3% copper per ton. No exploration or development occurred at the Iron Dyke in 1984.

Silver King's work at the Bay Horse Mine

began in 1984 under a lease agreement naming Silver King and Western Lands and Resources as partners and Silver King as the operator. The property is owned by Ibex Minerals Inc., who acquired it in 1977. Production reported to the State in 1984 was about 6,000 tons averaging 12 ounces of silver per ton. Ibex reported reserves of about 20,000 tons averaging about 15 ounces of silver per ton, and believes the chances are excellent that reserves can be expanded significantly. About 1,000 feet of underground work and 15,000 feet of drilling were done at Bay Horse in 1984.

Nickel.—The Hanna Mining nickel mine and smelter at Nickel Mountain, near Riddle in Douglas County, were reopened in December 1983 after an 18-month shutdown. The facilities operated throughout 1984 on a part-time basis. The smelter used electrical power purchased at a special contract rate during prescribed offpeak demand periods. Despite operating with a favorable labor contract and special power rates, the company experienced a monetary loss because the price of nickel did not firm up as expected. Some of the loss was temporarily offset by the use of higher grade ore for smelter feed. The high-grade ore, which is about 2% nickel, occurs in limited quantities, however, and cannot be produced for an extended period. Various methods of upgrading mine-run ore, including the installation of a wet screening process, were being considered. In 1984, 1,211,700 short tons of ore was screened and processed, and 29,080,000 pounds of nickel was used or shipped in the form of ferronickel. Ore trammed to the smelter averaged 1.20% nickel.

Titanium.—ALTi was constructing two pilot plants in Albany to develop a newly patented process for production of titanium powder and sponge from domestic ilmenite. Funding for the project came partly from a \$4 million Department of Defense grant. The new process, licensed by Occidental Petroleum Corp., was reported to be considerably different and lower cost than the conventional Kroll method. The Defense Department grant provided the financial impetus required by ALTi to activate company plans.

In December, Oregon Metallurgical in Albany raised its operating rate from 65% to 85% of its 9-million-pound-per-year sponge capacity.

¹State Mineral Officer, Bureau of Mines, Spokane, WA.

²Resident geologist, Oregon Department of Geology and Mineral Industries, Baker Field Office, Baker, OR.

Table 5.—Principal producers

Commodity and company	Address	Type of activity	County
Aluminum:			
Martin Marietta Aluminum Inc. ---	3313 West Second St. The Dalles, OR 97058	Smelter -----	Wasco.
Reynolds Metals Co -----	5100 NE Sundial Rd. Troutdale, OR 97060	-----do-----	Multnomah.
Cement:			
Ash Grove Cement West Inc. ¹ -----	111 SE. Madison St. Portland, OR 97214	Plants and quarries.	Baker.
Diatomite:			
Oil-Dri Production Co -----	Box 191 Christmas Valley, OR 97638	Surface mine and plant.	Lake.
Lime:			
Amalgamated Sugar Co. -----	Box 1766 Nyssa, OR 97913	Plant. -----	Malheur.
Ash Grove Cement Co -----	8900 Indian Creek Pkwy. Suite 600 Overland Park, KS 66225	-----do-----	Multnomah.
Nickel:			
The Hanna Mining Co -----	Box 85 Riddle, OR 97469	Surface mine and smelter.	Douglas.
Sand and gravel (construction):			
Afab Inc. (Empco Co. Inc.) -----	21800 NE. Glisan St. Fairview, OR 97024	Pit and plant --	Multnomah
Cascade Aggregates Inc. -----	Box 1225 Scappoose, OR 97056	-----do-----	Columbia.
River Bend Sand & Gravel Co -----	Box 12095 4420 Turner Rd. SE. Salem, OR 97309	Pit -----	Marion.
Ross Island Sand & Gravel Co -----	4129 SE. McLoughlin Blvd. Portland, OR 97202	Pit and plant --	Multnomah.
U.S. Forest Service, Region 6 -----	319 SW. Pine St. Portland, OR 97208	Pits -----	Various.
Western Pacific Construction Materials Co.	3510 SW. Bond Ave. Portland, OR 97201	Pit and plant --	Multnomah.
Talc (soapstone):			
Steatite of Southern Oregon Inc. ---	2891 Elk Lane Grants Pass, OR 97526	Surface mine and mill.	Jackson and Josephine.
Titanium:			
Oregon Metallurgical Corp. -----	Box 580 Albany, OR 97321	Smelter -----	Linn.
Zirconium:			
Teledyne Wah Chang Albany ² -----	1600 NE. Old Salem Rd. Albany, OR 97321	-----do-----	Do.

¹Also clays, pumicite, and crushed stone.²Also columbium, hafnium, tantalum, and vanadium.